

REMARKS

The Office Action of April 29, 2008 has been reviewed and the Examiner's comments carefully considered. Claims 1, 2, and 9-20 were withdrawn in view of an earlier restriction requirement. The Applicants reserve the right to file a divisional application directed to the non-elected claims. New claims 21-32 have been added to the application via the present Amendment in accordance with the specification as originally filed. No new matter has been added. Accordingly, claims 3-8 and 21-32 are currently pending in this application, and claims 3, 4, 21, and 22 are in independent form.

Claim Informalities

Claims 3-8 are objected to because of the following informalities: a) claims 3 and 4 recite a plurality of steps that are not separated by a line indentation; b) in claim 3, line 2, a word or comma appears to be missing between "seedlings" and "letting" in the phrase "the young moss seedlings letting"; and c) claims 5-8 at line 2 are missing an article after "wherein." The affected claims have been amended herewith in order to address the Examiner's objections. As such, removal of the objections to claims 3-8 are respectfully requested.

35 U.S.C. §112 Rejections

Claims 3 and 5-8 stand rejected under 35 U.S.C. §112, second paragraph, for indefiniteness. In particular, the Examiner alleges that there is insufficient antecedent basis for the limitation "the gametophytes of moss" in line 3 of claim 3; the limitation "moss" in line 2 of claims 5 and 6; the limitation "fertilizer concentration" in line 2 of claims 7 and 8; and the limitation "said nutrient solution" in lines 2-3 of claims 7 and 8. The affected claims have been amended herewith in order to address these claim rejections. As such, reconsideration and removal of the rejections to claims 3 and 5-8 are respectfully requested.

35 U.S.C. §103 Rejections

Claims 3 and 4 stand rejected under 35 U.S.C. §103(a) for asserted obviousness based on United States Patent No. 5,476,523 to Hiraoka (hereinafter "Hiraoka") in view of Meyer (American Journal of Botany, 1940; 27(4): 221-225) (hereinafter "Meyer"). In view of the amendments to claims 3 and 4 and the following remarks, the Applicants respectfully request reconsideration of these rejections.

The Examiner asserts that Hiraoka teaches a method of culturing moss tissues such as stems, leaves, etc., which would include moss gametophytes (col. 9, line 1). A

gametophyte is described in the present specification as having a leafy gametophyte (p. 9 of instant specification). The types of true moss of the Hiraoka method include the genus *Polytrichum*, *Leucobryum*, *Dicranum*, *Hypnum*, *Sphagnum*, etc. The moss tissues or gametophytes are cut and sterilized and cultured in a 1/5 NA-MS culture media (liquid) containing 0.1-10 μM of growth substance at a temperature of 20-25°C, which is between 0-60°C, for 30 to 60 days while shaking at 110-120 rpm/min and illuminating a light of about 1000-3000 lux (col. 9, lines 8-12). The conversion of 1000 lux to 3000 lux is 12.1 $\mu\text{molm}^{-2}\text{s}^{-1}$ to 36.3 $\mu\text{molm}^{-2}\text{s}^{-1}$ under a cool white fluorescent lamp, which is under 200 $\mu\text{molm}^{-2}\text{s}^{-1}$. The moss tissues eventually grew into moss seedlings.

The Examiner states that Hiraoka does not teach that the gaseous body includes oxygen which is in contact with the gametophytes of moss intermittently, and aerating and stirring. However, Meyer allegedly teaches a method of developing leafy gametophytes of *Physcomitrium turbinatum* (Urn Moss) in liquid media, as follows. Mature capsules of Urn Moss were opened by sterilized needles, and the spores were scattered on the nutrient solution (Benecke's solution and Detmer's solution). After germination the protonemata were transferred to a nutrient culture in an Erlenmeyer flask containing 100 cc. of solution. The nutrient solution was changed once a month, thus allowing air, which includes oxygen, into the flask intermittently. The cultures were rotated at frequent intervals so the protonemal threads would not stick to the bottom or sides of the flask. Gas bubbles that accumulated along the filaments were freed by using a glass needle so that the protonemata would not float to the surface (p. 222, left col., 1st par.). By using the glass needle to free the filament, the culture is being stirred. The cultures were kept at normal laboratory temperature and the light source was an artificial cool light (p. 222, left col. 2nd par.). The conversion of an artificial cool light is 36.3 $\mu\text{molm}^{-2}\text{s}^{-1}$, which is under 200 $\mu\text{molm}^{-2}\text{s}^{-1}$. The average room temperature of 20-25°C is between 0 to 60°C.

As such, the Examiner asserts that it would have been obvious to one of ordinary skill in the art at the time the invention was made to use the method of producing moss seedlings, as taught by Hiraoka, and to combine that method by letting a gaseous body, which includes oxygen, contact the gametophytes of moss intermittently, and aerating and stirring, as taught by Meyer. Meyer teaches that the filaments in the flask were stirred so that the protonemata would not float to the top of the surface. The Examiner states that by stirring

the culture, as taught by Meyer, bubbles would form, thus, a gaseous body including oxygen is in contact with the gametophyte. Moreover, the Examiner states that Meyer teaches that the nutrient solution is replaced every month, or intermittently, and by doing so would allow air, including oxygen, into the culture. Thus, the Examiner asserts that one of ordinary skill in the art would have a reasonable expectation of success in the combination of producing moss seedlings, as taught by Hiraoka, and contacting the gametophyte with a gaseous body, which includes oxygen, and contacting the gametophyte of moss intermittently, as taught by Meyer, because both Hiraoka and Meyer produced growth of young moss seedlings. The Applicants respectfully disagree with the Examiner.

As reiterated by the Supreme Court in *KSR Int'l Co. v. Teleflex Inc.*, 550 U.S. ___, 82 U.S.P.Q.2d 1385 (2007), the framework for the objective analysis for determining obviousness under 35 U.S.C. §103 is stated in *Graham v. John Deere*. Examination Guidelines for Determining Obviousness Under 35 U.S.C. 103 in View of the Supreme Court Decision in *KSR International Co. v. Teleflex Inc.*, 72 Fed. Reg., No. 195 (October 10, 2007) at page 57527 (hereinafter "Examination Guidelines"). The factual inquiries enunciated by the Court are as follows:

- (1) Determining the scope and content of the prior art;
- (2) Ascertaining the differences between the claimed invention and the prior art; and
- (3) Resolving the level of ordinary skill in the pertinent art.

Examination Guidelines at page 57527.

"The ultimate determination of patentability must be based on consideration of the entire record, by a preponderance of evidence, with due consideration to the persuasiveness of any arguments and any secondary evidence." Manual of Patent Examining Procedure, (Sept. 2007) §716.01(d) and *In re Oetiker*, 24 U.S.P.Q.2d 1443, 1444 (Fed. Cir. 1992).

The Examiner correctly states that Hiraoka does not teach that the gaseous body includes oxygen which is in contact with the gametophytes of moss, and aerating and stirring. In this regard, Meyer states that the nutrient solution was changed once a month (page 222, left column, 1st par.), thus allowing air, which includes oxygen, into the flask intermittently. However, claim 3 of the present application has been amended herewith to add the restriction of "by bubbling via the pumping of a gaseous body including oxygen." By this, it can be understood that instead of changing the water, which may include exposure to

oxygen once a month, the present claims require oxygenation "by bubbling via the pumping of a gaseous body including oxygen." In addition, Meyer "freed" or removed gas bubbles which accumulated among the filaments with a glass needle so that the interwoven mass of protonemata did not float at the surface of the solution, but remained submerged in every culture (page 222, left column, 1st par.). As such, Meyer actually teaches away from the methods of the present invention.

Therefore, neither Hiraoka nor Meyer, whether alone or in combination, teach the limitation of claim 3 of the present application of "by bubbling via the pumping of a gaseous body including oxygen." Further, neither Hiraoka nor Meyer, whether alone or in combination, teach the limitation of claim 4 of the present application that gametophytes of moss are grown in nutrient solution "by aerating and stirring by bubbling a gaseous body including oxygen." In light of the foregoing claim amendments and remarks contained herein, it is respectfully asserted that none of the prior art references cited by the Examiner, alone or in combination, teach, disclose, or suggest the claimed subject matter of the present invention in independent claims 3 and 4. As such, Applicants assert that independent claims 3 and 4 are patentable over the prior art of record. Reconsideration of the rejections and allowance of amended independent claims 3 and 4 are respectfully requested. Further, newly presented claims 21-32 depend from, and add further limitations to, one of independent claims 3 and 4. As such, allowance of claims 21-32 are also respectfully requested.

Claims 5-6 are rejected under 35 U.S.C. §103(a) as being unpatentable over Hiraoka in view of Meyer as applied to claims 3-4 above, and further in view of Sabovljevic et al (Turk. J. Bot. 27 (2003) 441-446, hereinafter "Sabovljevic").

As stated by the Examiner, Hiraoka in view of Meyer does not teach that the moss is grown by repeating light periods and dark periods in cycles of 24 hours or less duration. However, Sabovljevic allegedly teaches a method of growing moss by culturing apical shoots of the gametophytes of *Eurhynchium praelongum* (p. 442, right col., 1st full par.). The apical shoots were sterilized and transferred to a Petri dish containing 20 ml basal medium (p. 442, right col., 2nd full par.). The cultures were grown at 25°C, which is between 0-60°C, under cool white fluorescent light (33.5-45 mmol/sm² irradiance) and day/night cycles of 16/8 hours (p. 443, left col., 1st par.). The plants were subcultured at one month intervals. Secondary protonema developed in 3 months after *in vitro* culture in MS₁ (p. 443, right col. 1st full par. and Table 2).

The Examiner asserts that it would have been obvious to one of ordinary skill in the art at the time the invention was made to use the method of producing young moss seedlings as taught by Hiraoka in view of Meyer, and to combine it with the method of repeating light/dark periods, as taught by Sabovljevic. The Examiner states that one of ordinary skill in the art would have been motivated to do so, given that 40% of the moss species are endangered and there is a need to protect them, and one way is by reproduction (Sabovljevic, p. 442, left col., 1st par.). Furthermore, the Examiner asserts that one of ordinary skill in the art would have a reasonable expectation of success in the combination of producing young seedling moss, as taught by Meyer, and growing the moss by repeating light/dark periods, as taught by Sabovljevic, because both produced growth of mosses.

However, as discussed above, neither Hiraoka nor Meyer, whether alone or in combination, teach the limitation of claim 3 of the present application of "by bubbling via the pumping of a gaseous body including oxygen." Further, neither Hiraoka or Meyer, whether alone or in combination, teach the limitation of claim 4 of the present application that gametophytes of moss are grown in nutrient solution "by aerating and stirring by bubbling a gaseous body including oxygen." The teachings of Sabovljevic do not cure these deficiencies. As such, and because claims 5 and 6 are dependant upon independent claims 3 and 4, respectively, they should be deemed to contain allowable subject matter for at least the same reasons as claims 3 and 4. Thus, Applicants respectfully request reconsideration and withdrawal of the rejections of claims 5 and 6.

Claims 7-8 are rejected under 35 U.S.C. §103(a) as being unpatentable over Hiraoka in view of Meyer as applied to claims 3-4 above, and further in view of Virtanen et al (Plant Ecology, vol. 151, 2002, pages 129-141, hereinafter "Virtanen").

As stated by the Examiner, Hiraoka in view of Meyer does not teach that the fertilizer concentration is 0 to 1.0 (mS/cm). However, Virtanen allegedly teaches the effects of fertilizer in bryophyte biomass, and that bryophyte biomass was greater when farm yard manure and fishmeal as fertilizers were applied to the plot (p. 133, left col., last par., p. 139, left col., 1st full par., and Fig. 1).

The Examiner asserts that it would have been obvious to one of ordinary skill in the art at the time the invention was made to use the method of producing young moss seedlings as taught by Hiraoka in view of Meyer and to combine the method of fertilizing the moss seedlings as taught by Virtanen. The Examiner notes that, although Virtanen is silent to

the concentration of fertilizer, it would have been obvious to one of ordinary skill in the art to adjust the amount of fertilizer concentration to achieve the desired results -- more moss seedlings. Moreover, Virtanen allegedly shows that bryophyte biomass increased when farm yard manure and fishmeal were applied. Thus, the Examiner asserts that it would have been obvious to one of ordinary skill in the art to try to fertilize the young moss seedlings because Virtanen taught that when fertilizer was applied to the mosses an increase of biomass was noted.

However, as discussed above, neither Hiraoka nor Meyer, whether alone or in combination, teach the limitation of claim 3 of the present application of "by bubbling via the pumping of a gaseous body including oxygen." Further, neither Hiraoka nor Meyer, whether alone or in combination, teach the limitation of claim 4 of the present application; that gametophytes of moss are grown in nutrient solution "by aerating and stirring by bubbling a gaseous body including oxygen." The teachings of Virtanen do not cure these deficiencies. As such, and because claims 7 and 8 are dependant upon independent claims 3 and 4, respectively, they should be deemed to contain allowable subject matter for at least the same reasons as claims 3 and 4. Thus, Applicants respectfully request reconsideration and withdrawal of the rejections of claims 7 and 8.

Conclusion

In view of the above amendments and remarks, reconsideration of the claim objections, rejections and allowance of pending claims 3-8 and 21-32 are respectfully requested.

Respectfully submitted,

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